600 **DIRECTOR OF SPACE SCIENCES**

Plans, organizes, directs, and evaluates a broad program of scientific research, both theoretical and experimental, in the study of space phenomena. The program ranges from basic research, to flight experiment development, to mission operations and data analysis.

603 SPACE SCIENCES ADMINISTRATION AND RESOURCES MANAGEMENT OFFICE

Responsible for the administration and management of all Space Sciences Directorate (SSD) resources in support of the Directorate's technical program. Primary financial and business management functions include coordination and administration of budget planning and execution for both the programmatic and institutional requirements to the Directorate's laboratories and offices and their associated flight instruments, mission operations and data analysis (MO&DA) projects and supporting research and technology programs. Major responsibility also includes resource monitoring, analysis and administrative reporting associated with the Directorate's overall resources. Also responsible for the implementation of all NASA/GSFC policies and procedures relating to proper financial and business management within the SSD as well as any coordination and review activity to assess compliance.

630 SPACE SCIENCE DATA OPERATIONS OFFICE

The Space Science Data Operation Office (SSDOO) manages and operates three major data intensive branches performing various space data operations activities. Each branch in the Division is responsible for the development and operations of data and information systems which support processing, management, archiving and distribution of space physics, astrophysics, and other OSS data and information. The data systems provide support to many of the Laboratory research needs within the Space Science Directorate and the scientific needs of the space science research community in general. It accomplishes this through the archiving, cataloging, and dissemination of space science data and provides many specialized science support services and systems involving sensor algorithm development, processing, and mission planning. The Division is heavily involved in the science operations of several key spacecraft and interfaces with Code 500, the space science laboratories, the mission-specific space science community, the general NASA space science community.

The SSDOO serves the Directorate as a key interface for coordinating data management and archiving plans with NASA Headquarters Information Systems Branch, Astrophysics Division, Space Physics Division, and Office of Aeronautics, Space, and Technology

630.1 ORBITING SATELLITES PROJECT

Provides project management and technical direction for the control of selected operating satellites. These satellite programs are in support of the research efforts of the Agency. They may be mission unique or part of a continuing series. In every case, they are satellites which have been launched and adequately checked out by the originating project. The Director of Flight Projects and the Director of Space Sciences, after consultation with and approval by the Center Director, will officially designate satellites for inclusion in the Project. Responsibility include overall business and technical management of orbital operations, contract maintenance and closeout, scientific and technological experimentations, data processing and dissemination, projectwide planning and evaluation, monitoring and analyzing the status of spacecraft and experiment hardware, maintaining liaison with the data user community, and developing alternate modes of operation of maximize the scientific return of the mission.

631 ASTROPHYSICS DATA FACILITY

The Astrophysics Data Facility (ADF) works closely with Code 600 Laboratory and flight project personnel in astrophysics science data processing operations activities. The ADF will interface, as appropriate, with the Laboratory for High Energy Astrophysics and the Laboratory for Astronomy and Solar Physics by producing appropriate data products for archiving and distribution, providing data system planning, and developing tools for user/observatory support serving scientists' needs. Specifically, this branch is responsible for supporting the High Energy Astrophysics Science Archive Research Center (HEASARC) and future operations and archiving activities in conjunction with Codes 660 and 680. The data intensive processing of level 0 data to level 1 data products is accomplished by the ADF on astrophysics data from both NASA and international missions such as ROSAT, ASCA, and XTE.

This Facility provides support for science data operations for several key astrophysics missions and interfaces with Code 500, mission-specific science staff, and LHEA and LASP scientists. The ADF operates and develops specific mission planning tools which will aid potential science investigators in proposal preparations and observation planning. The ADF develops and integrates state-of-the-art capabilities and systems necessary to carry out its mission.

632 SPACE PHYSICS DATA FACILITY

The Space Physics Data Facility (SPDF) works closely with the Laboratories of the Goddard Space Flight Center Space Sciences Directorate, with the NASA and international science and technical communities, with US industry and with NASA flight project managers and personnel in space physics mission and mission support systems definition; advanced science data system definition, design, development, and oversight; and oversight of on-going mission operations and administration for select space physics flight projects and NASA programs.

The SPDF leads in defining standards and policies to promote the effective use of space physics data products. The SPDF defines, designs, and develops innovative concepts and capabilities to cost-effectively serve critical NASA space physics programmatic and science data needs in e.g; supporting the creation and maximal use of multi-source, multi-parameter, and multi-project data sets and databases. The SPDF defines and develops such advanced systems for specific NASA flight projects and leads the development of internationally-accessible advanced data and information systems in the areas of solar-terrestrial physics. The SPDF performs basic and strategic space physics and information systems innovative research, develops advanced demonstration/ prototype technical capabilities and develops/integrates state-of-the-art capabilities and systems necessary to carry out its mission.

The SPDF develops, implements, and oversees operation of the Satellite Situation Center (SSC), which provides mission planning information for scientists involved in the International Solar-Terrestrial Physics (ISTP) and Global Geospace Science (GGS) programs, other agency spacecraft science operations planning and science planning in support of the Interagency Consultative Group's (IACG's) solar-terrestrial science campaigns. The SPDF develops and implements programs such as Coordinated Data Analysis Workshops (CDAWs) and other advanced technology approaches best enabling coordinated science for the international space physics research community. The SPDF data systems to the best benefit of the science and educational communities and to promote transfer of appropriate technologies to US industry.

The SDPF hosts the ISTP Science Office (ISO), which is responsible for the overall management of operational ISTP missions, NASA-supported elements of international mission and other ISTP-related mission or other missions as may be assigned to this Office over time. The ISO in close technical cooperation with other parts of SPDF will be responsible to define and implement an ongoing program for MO&DA cost reductions of simultaneously minimal impact to ISTP science and to facilitate achieving all science and programmatic goals of ISTP.

633 NATIONAL SPACE SCIENCE DATA CENTER & WORLD DATA CENTER-A

The National Space Science Data Center (NSSDC) and World Data Center-A for Rockets & Satellites serves as the permanent long-term archive and distribution center for a broad range of OSS space science satellite data and information. It is responsible for the development, maintenance, and operation of discipline-independent interoperable master directories, catalogs, data standards, and other information services; support of NASA Headquarters with oversight function of preservation; access to existing and future NASA space science archives; management and support, as requested, of Data Center node(s) for science discipline data systems; and participation in the development of a nationally accessible science data system.

It is responsible for the operation of NASA's space science World Data Center-A which serves as NASA's agent for international exchange of space science information and data. The NSSDC/WDC-A R&S maintains the necessary in-house expertise to support OSS data management including related advanced information and storage technologies for distributed and intelligent data systems. The NSSDC develops and integrates state-of-the-art capabilities and systems necessary to carry out its mission and is responsible for maintaining useful products and publications.

660 LABORATORY FOR HIGH ENERGY ASTROPHYSICS

High Energy Astrophysics is the study, by way of high energy photons and particles, of cosmic systems and sites and the physics processes operating therein. These studies involve X-rays, gamma-rays, and energetic charged particles. High energy photons and particles astrophysics are complementary, the emission of X-rays and gamma-rays invariably being the signature for the presence of energetic particles. Studies of the mechanisms that release energy and accelerate particles, and of the mechanisms that convert the kinetic energy of these particles into observable radiation, are the essential ingredients of high energy astrophysics. The LHEA conducts a broad program of research in the phases of theoretical and experimental astrophysics dealing with the sources, nauter, and effect of particles and photons having energies appreciably greater then thermal. The LHEA scientists develop theoretical models of the origin and structure of astrophysical objects and processes, designs experimental approaches and hardware to test these theories, and interprets and evaluates data gathered from the experiments, analyzes, and disseminates the data, and publishes conclusions drawn therefrom.

OFFICE FOR GUEST INVESTIGATOR PROGRAMS

The Office for Guest Investigator Programs (OGIP) is established within the LHEA to support and expand the use, by the broadcast possible community, of high energy astrophysics data through guest observer programs, data analysis software, instrument calibration, multimission standards and archive access. The OGIP is responsible for the High Energy Astrophysics Science Archive Center, the ASCA, ROSAT, and XTE guest observer facilities, and the Compton Gamma Ray Observatory Science Support Center. Data from these and older missions, e.g., EXOSAT, OSO8, HEAO 1, the Einstein Observatory, and BBXRT, are also included with future mission data added as appropriate. The OGIP is also responsible for administering the guest observer programs for the ASCA, CGRO, ROSAT, and XTE missions, and other future high energy astrophysics missions.

661 GAMMA RAY AND COSMIC RAY ASTROPHYSICS BRANCH

Studies the origin, nature, and effect of galactic and solar cosmic rays, as well as electromagnetic radiation which may carry signatures of nuclear and acceleration processes.

662 X-RAY ASTROPHYSICS BRANCH

Conducts scientific investigations of astrophysical systems utilizing the X-radiation that they produce.

663 INSTRUMENT DEVELOPMENT BRANCH

Provides electronic systems and circuit designs, both analog and digital, and all associated ground support equipment and special test equipment necessary to support the design development, test, calibration, and qualification of completed instruments for satellite, rocket, and balloon-borne investigations of x-ray, gamma ray, and charged particle phenomenon. Develops package design and new packaging technologies such as semi-custom integrated circuits, gate arrays, and other implementations, and provides definition of test software as needed to support the above activities.

664 DATA MANAGEMENT AND PROGRAMMING OFFICE

Defines the computer requirements for data processing and analysis functions for the Laboratory. Designs, develops, and implements the computer programming required for the processing and analysis of astrophysical data. Supervises and performs the production processing of all data through the final analysis phases. Manages all aspects of the Laboratory's computer processing and serves as the focal point for all computer related matters. Develops requirements for and monitors performance of all contracts for programming and data processing support services.

680 LABORATORY FOR ASTRONOMY AND SOLAR PHYSICS

Conducts a broad program of research in experimental and theoretical astronomy and solar physics. Studies astrophysical phenomena of the Sun and stars with emphasis on their structure, origin, and evolution. Studies the gross dynamics and transient phenomena of the atmospheres of the Sun and other stars, with emphasis on phenomena revealed by spectroscopic observations made above the Earth's atmosphere and correlated with ground-based observations. Studies the Milky Way galaxy, other galaxies, quasars, and radio galaxies with special emphasis on those parameters which bear on the present structure of the Universe, as well as on its origin, age, and future fate. Also investigates the chemical history of the solar system and the nature of the solar wind interaction with comets. Includes a senior science group which carries out innovative research programs in all areas within the scope of the Laboratory. Carries out project scientist functions, planning functions, and advisory functions as required for high-level support of Laboratory programs.

680.1 HUBBLE SPACE TELESCOPE (HST) EXPERIMENTS MANAGEMENT OFFICE

Manages the design, development, testing, calibration, and sustaining engineering for the Laboratory's instruments on HST. These now include the Goddard High Resolution Spectrograph (GHRS) and the Space Telescope Imaging Spectrograph (STIS). Manages industrial contracts necessary to carry out the above functions. Works closely with the Principal Investigators and the HST Project Office to assure that the performance requirements necessary to meet the scientific objectives are being met. Supervises a team formed from other elements of Code 680 and supported by Codes 200, 300, 600, 700, and local support contractors, who perform in-house technical tasks and monitor the prime contracts.

681 ULTRAVIOLET/OPTICAL ASTRONOMY BRANCH

Carries out observational and theoretical programs which emphasize the entire range of non-solar astronomy including the structure and evolution of stars; the physical properties of stellar atmospheres; the nature of the interstellar medium; the structure of the Milky Way galaxy; the nature of other galaxies, especially quasars and radio galaxies; and the size, age, origin, and geometry of the Universe.

682 SOLAR PHYSICS BRANCH

The Solar Physics Branch performs scientific research directed toward a more profound understanding of the Sun, both as a star in its own right and as the star whose radiative and particle emissions have a profound effect on the Earth. In particular, the following scientific goals are pursued: understanding solar subsurface convection and solar

magnetism, understanding solar pulsations and interior structure, understanding coronal heating and the acceleration of the solar wind, understanding solar flares and the solar activity cycle. To achieve these goals, experiments are built for operation on balloons, sounding rockets, and satellites, and plans are developed for possible future opportunities on the Space Shuttle and the Space Station. Analysis of data from these experiments is conducted and the results are presented by Branch scientists at scientific meetings and published in the open, refereed literature.

685 INFRARED ASTROPHYSICS BRANCH

Performs observational and theoretical studies of celestial sources of infrared and sub-millimeter wavelength radiation, with emphasis on galactic sources, the interstellar medium, extragalactic objects, the diffuse infrared background, and the cosmic background radiation. Relates the observations to the energetics and physical and chemical properties of the sources, and relates cosmic background data to models of the early universe. Develops incoherent infrared sensors for application in photometric and medium resolution spectrometric instruments, and coherent sensors for sub-millimeter wavelength spectral line receivers. Makes ground-based and flight observations and performs theoretical analyses of the nature of the radiating sources and emission processes.

686 INSTRUMENT/COMPUTER SYSTEMS BRANCH

Designs, develops, and assesses the scientific quality of advanced, high performance astronomical instrumentation at wavelengths from infrared to gamma-ray. The instrumentation is flown on satellites, rockets, balloons, aircraft, and STS, and is used in ground-based applications. Provides for the development and operation of laboratory equipment needed for instrument development and calibration. Provides design, development, and test for advanced detector, electronic and optical-mechanical instrumentation in support of scientists in the laboratory.

Plans, develops, and operates computer software and hardware systems for the reduction, analysis, and interpretation, of laboratory experimental data and for the theoretical study of the structure, dynamics, and other phenomena of the Sun, stars, interstellar medium, and galaxies. Develops applications software to support Laboratory research. Designs, implements, and maintains local area networks needed to connect Laboratory computer systems ranging from personal computers to Project facilities.

690 **LABORATORY FOR EXTRATERRESTRIAL PHYSICS**

Studies the physical properties, composition, structure, and dynamical processes of solar, interplanetary, and interstellar media; planetary atmospheres and magnetospheres; astrophysical sources; comets; magneto-hydromagnetics of the lunar and planetary environments; and radio emissions from solar planetary and interplanetary environments. Conducts theoretical studies and experimental observations, both in situ and remote, of magnetic fields, electric fields, charged particles, and plasmas in space and in the laboratory, when appropriate.

691 ASTROCHEMISTRY BRANCH

Performs experimental and theoretical research related to the chemistry and physics of comets, interstellar gas and grains, the atmospheres of planets, the upper atmosphere and stratosphere of the Earth, and acceleration from primordial nebulae. Carries out theoretical investigations of the formation and evolution of these astronomical systems and the interrelationship among them. Proposes, devises, and carries out spectroscopic observations employing ground-based, rocket, and satellite instruments.

692 INTERPLANETARY PHYSICS BRANCH

Proposes, develops, fabricates, and integrates experiments to measure the characteristics of magnetic fields and plasmas in space using both direct and indirect methods. Analyzes and interprets the results of these experiments to construct physical models of the phenomena involved, and correlates them with other solar, terrestrial, and planetary phenomena. Incorporates a group which develops the theory of astrophysical plasmas and fluctuating magnetic fields with emphasis on understanding those magnetized plasmas in the solar system which can be or will be investigated in situ. Of special interest are the solar wind and solar radio bursts and interaction between the solar wind and energetic particles. Conducts theoretical and experimental studies of the composition, structure, and dynamics of astrophysical objects, such as planetary atmospheres, molecular clouds, stars and quasars, with primary emphasis on observations in the infrared and microwave region. Develops experimental methods and designs instrumentation required for continuum and spectral line observations in this wave-length region. Conducts laboratory studies, makes ground-based and flight observations, and performs theoretical analysis of the nature of the radiating sources and emission processes.

693 PLANETARY SYSTEMS BRANCH

Conducts theoretical and observational studies of the composition, structure, and dynamics of solar-system bodies such as planets, comets, and the sun; and of discrete galactic objects such as interstellar clouds, stars, and nebulae. Primary emphasis is placed on understanding the origins, evolutionary history, and present state of planets in our solar system; on understanding the processes which influence the formation and evolution of planetary systems; and on determining the frequency of occurrence of planetary systems. Observational emphasis is placed on spectroscopy and imaging at infrared and sub-millimeter wavelengths, using both coherent and incoherent detection methods. High and very-high resolution spectrometers are developed for studying both gaseous and solid-phase material in these sources. Branch scientists conduct laboratory investigations of the spectra of gaseous and solid-phase material, makes ground-based and flight observations, and performs theoretical analysis of the nature of the radiating sources and emission processes.

695 PLANETARY MAGNETOSPHERES BRANCH

Studies the basic physical properties of the planets and their satellites with particular emphasis on their magnetohydrodynamic characteristics and environments. Conducts theoretical and experimental investigations of the properties and origin of planetary magnetic fields, of the structure and dynamics of planetary magnetospheres, and of the interaction of the interplanetary medium with planetary ionospheres and magnetospheres. Develops and performs both in situ and remote experiments to measure the magnetic fields, plasmas, and radio emissions in planetary environments.

696 ELECTRODYNAMICS BRANCH

Conducts experimental and theoretical investigations of electric fields and plasmadynamic phenomena in the near- Earth space environment. Studies interactions between electric and magnetic fields and space plasmas causing temporal and spatial variations influencing the motion and composition of plasmas and neutral gases in the Earth's atmosphere. Utilizes chemical releases to trace, simulate, and modify conditions and phenomena in space to obtain information on atmospheric-magnetospheric coupling processes and the transport and chemistry of atmospheric gases. Investigates ionospheric irregularities, electric field turbulence, and the origin and propagation of electrostatic and hydromagnetic waves. Investigates electric fields in the Earth-ionosphere cavity and the electrodynamics of the middle atmosphere, and endeavors to understand the potential role of electric fields in solar- weather relationships.